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**ATOFINA, Plaintiff-Appellant, v. GREAT LAKES CHEMICAL CORPORATION,  
Defendant-Appellee.**

05-1359

**UNITED STATES COURT OF APPEALS FOR THE FEDERAL CIRCUIT**

*441 F.3d 991; 2006 U.S. App. LEXIS 7180; 78 U.S.P.Q.2D (BNA) 1417*

**March 23, 2006, Decided**

**PRIOR HISTORY:** [\*\*1] Appealed from: United States District Court for the District of Delaware. Chief Judge Sue L. Robinson. *Atofina v. Great Lakes Chem. Corp.*, 2005 U.S. Dist. LEXIS 7365 (D. Del., Mar. 16, 2005)

**DISPOSITION:** AFFIRMED IN PART AND REVERSED IN PART.

**CASE SUMMARY:**

**PROCEDURAL POSTURE:** Plaintiff sued for patent infringement of U.S. Patent 5,900,514 ('514 patent). The invention was directed to a method of synthesizing difluoromethane. The U.S. District Court for the District of Delaware found that defendant did not literally infringe the '514 patent, certain claims of the '514 patent were anticipated by a Japanese publication, and the patent was unenforceable because of inequitable conduct. Plaintiff appealed.

**OVERVIEW:** The infringement issue turned on the claim construction of "chromium catalyst." The appellate court agreed with the district court's construction of "chromium catalyst" as a catalyst where the only catalytically active material was chromium without addition of metal oxides or non-inert additives. The intrinsic record supported that interpretation. The prosecution history confirmed a construction of "chromium catalyst" that excluded metal oxides and non-inert additives. The district court correctly found that defendant did not infringe plaintiff's properly construed claims. However, the district court clearly erred in finding that the Japanese publication anticipated the '514 patent. The district court's determination that the publication disclosed the temperature range in claims 1,2, 6, 7,9, and 10 was grounded in its erroneous application of Titanium Metals. The district court clearly erred in finding that the publication disclosed the temperature range, the range of oxygen to methylene chloride molar ratios, and the contact times claimed in the '514 patent. Finally,

the district court abused its discretion in its conclusion that inequitable conduct occurred.

**OUTCOME:** The appellate court affirmed the district court's claim construction of the term "chromium catalyst" and hence its determination of no literal infringement. The appellate court reversed the district court's holdings of invalidity because of anticipation and unenforceability because of inequitable conduct.

**LexisNexis(R) Headnotes**

*Patent Law > Infringement Actions > Claim Interpretation > General Overview*

*Patent Law > Jurisdiction & Review > Standards of Review > General Overview*

[HN1] Claim construction is an issue of law that the appellate court reviews de novo. The district court's determination of infringement, in contrast, is a question of fact that the appellate court reviews for clear error. Anticipation is also a question of fact that the appellate court reviews for clear error. The appellate court reviews a district court's ultimate determination of inequitable conduct for abuse of discretion, and its threshold findings regarding materiality and intent to mislead for clear error. A finding is "clearly erroneous" when although there is evidence to support it, the reviewing court on the entire evidence is left with the definite and firm conviction that a mistake has been committed.

*Patent Law > Claims & Specifications > General Overview*

*Patent Law > Infringement Actions > Claim Interpretation > Aids*

[HN2] The court's primary focus in determining the ordinary and customary meaning of a claim limitation is to consider the intrinsic evidence of record, viz., the patent itself, including the claims, the specification and, if in evidence, the prosecution history, from the perspective of one of ordinary skill in the art. At the same time, courts

may rely on dictionary definitions when construing claim terms and that dictionaries are often useful to assist in understanding the commonly understood meaning of words. However, the court must ensure that any reliance on dictionaries accords with the intrinsic evidence: the claims themselves, the specification, and the prosecution history. In those circumstances where reference to dictionaries is appropriate, the court's task is to scrutinize the intrinsic evidence in order to determine the most appropriate definition.

***Patent Law > Infringement Actions > Claim Interpretation > Aids***

[HN3] Because dictionaries, and especially technical dictionaries, endeavor to collect the accepted meanings of terms used in various fields of science and technology, those resources have been properly recognized as among the many tools that can assist the court in determining the meaning of particular terminology to those of skill in the art of the invention. Such evidence may be considered if the court deems it helpful in determining the true meaning of language used in the patent claims.

***Patent Law > Infringement Actions > Claim Interpretation > General Overview***

***Patent Law > Infringement Actions > Prosecution History Estoppel > General Overview***

[HN4] The prosecution history can often inform the meaning of the claim language by demonstrating how the inventor understood the invention and whether the inventor limited the invention in the course of prosecution, making the claim scope narrower than it would otherwise be.

***Patent Law > Infringement Actions > Claim Interpretation > General Overview***

***Patent Law > Infringement Actions > Prosecution History Estoppel > Abandonment & Amendment***

[HN5] It frequently happens that patentees surrender more through amendment than may have been absolutely necessary to avoid particular prior art. In such cases, the court has held the patentees to the scope of what they ultimately claim, and the court has not allowed them to assert that claims should be interpreted as if they had surrendered only what they had to.

***Patent Law > Anticipation & Novelty > General Overview***

[HN6] Anticipation requires a showing that each limitation of a claim is found in a single reference, either expressly or inherently.

***Patent Law > Anticipation & Novelty > General Overview***

[HN7] It is well established that the disclosure of a genus

in the prior art is not necessarily a disclosure of every species that is a member of that genus. There may be many species encompassed within a genus that are not disclosed by a mere disclosure of the genus. On the other hand, a very small genus can be a disclosure of each species within the genus.

***Patent Law > Anticipation & Novelty > General Overview***

[HN8] An earlier species reference anticipates a later genus claim, not that an earlier genus anticipates a narrower species.

***Patent Law > Anticipation & Novelty > General Overview***

[HN9] Anticipation by inherent disclosure is appropriate only when the reference discloses prior art that must necessarily include the unstated limitation.

***Patent Law > Inequitable Conduct > Effect, Materiality & Scienter > Elements***

[HN10] A patent may be rendered unenforceable for inequitable conduct if an applicant, with intent to mislead or deceive the examiner, fails to disclose material information or submits materially false information to the Patent and Trademark Office during prosecution. The party asserting inequitable conduct must prove a threshold level of materiality and intent by clear and convincing evidence. Further, materiality does not presume intent, which is a separate and essential component of inequitable conduct.

***Patent Law > Inequitable Conduct > Effect, Materiality & Scienter > Duties***

[HN11] The duty at issue is the duty of candor, not the duty of translation. Intent to deceive can not be inferred solely from the fact that information was not disclosed; there must be a factual basis for a finding of deceptive intent.

**COUNSEL:** Thomas G. Rowan, Jones Day, of New York, New York, argued for plaintiff-appellant. With him on the brief were Daniel L. Malone, Eric C. Stops, and Gasper J. LaRosa.

Richard D. Harris, Greenberg Traurig LLP, of Chicago, Illinois, argued for defendant-appellee. With him on the brief was Brad R. Bertoglio.

**JUDGES:** Before LOURIE, RADER and DYK, Circuit Judges. Opinion for the Court filed by Circuit Judge LOURIE. Opinion concurring in part and dissenting in part filed by Circuit Judge DYK.

**OPINIONBY:** LOURIE

**OPINION:** [\*993] LOURIE, Circuit Judge.

Atofina appeals from the final decision of the United States District Court for the District of Delaware granting judgment in favor of Great Lakes Chemical Corporation ("Great Lakes") that Great Lakes did not literally infringe U.S. Patent 5,900,514 (the "'514 patent"); claims 1, 2, 6, 7, 9, and 10 of the '514 patent were anticipated by Japanese publication 51-82206 ("JP 51-82206"); and the '514 patent was unenforceable because of inequitable conduct. *Atofina v. Great Lakes Chem. Corp.*, 2005 U.S. Dist. LEXIS 7365, Civ. No. 02-1250 (D. [\*\*2] Del. March 23, 2005) ("Final Judgment"). We affirm the district court's claim construction of the term "chromium catalyst" and hence its determination of no literal infringement. However, because the district court clearly erred in finding that JP 51-82206 was an anticipatory reference meeting all the limitations of claims 1, 2, 6, 7, 9, and 10 of the '514 patent and also clearly erred in finding that the applicants of the patent intended to deceive the United States Patent and Trademark Office ("PTO"), we reverse its holdings of invalidity because of anticipation and unenforceability because of inequitable conduct.

#### BACKGROUND

The '514 patent is entitled "Synthesis of Difluoromethane," and was issued to Elf Atochem, which subsequently became Atofina, as assignee. The invention is directed to a method of synthesizing difluoromethane ( $\text{CH}_2\text{F}_2$ ) through the gas phase fluorination of methylene chloride ( $\text{CH}_2\text{Cl}_2$ ), with hydrogen fluoride (HF), in the presence of an amount of oxygen ( $\text{O}_2$ ) within a particular temperature range, and with a chromium (Cr) catalyst. Claim 1 requires that the process be conducted in the presence of 0.1 to 5 moles of oxygen per 100 moles of [\*\*3] methylene chloride, at a temperature of between 330 and 450 [degrees] C, with a "bulk or supported chromium catalyst." '514 patent, col. 7, II. 20-25. The remaining asserted claims, 2, 5, 6, 7, 9, and 10, add further limitations: claim 2 further narrows the range of oxygen to methylene chloride ratios; claim 6 adds a requirement that the methylene chloride, oxygen, and hydrogen fluoride be in contact with the catalyst for a time between 0.01 and 10 seconds; claim 7 adds a pressure limitation requiring between 1 and 20 bars absolute; claim 9 is the same as claim 1 but with a different transition phase; and claim 10 is the same as claim 1 but with the addition of the contact time limitation from claim 6. *Id.*, col. 7, II. 26-27, col. 8, II. 3-11, 14-28.

In 1993, Great Lakes began manufacturing difluoromethane using a mixed metal catalyst consisting of a chromium compound with another element that the district court referred to as Agent X, n1 carried out in the

presence of 1.1 to 1.2 moles of oxygen per 100 moles of methylene chloride, [\*994] at a temperature of 150 to 350 [degrees] C, and at a pressure between 5.5 and 7.6 bars absolute. *Atofina v. Great Lakes Chem. Corp.*, 2005 U.S. Dist. LEXIS 7347, Civ. No. [\*\*4] 02-1250, *slip op. at 18* (D. Del. Feb. 23, 2005) ("Opinion"). The reactants in the process are in contact with the catalyst for approximately 10 seconds. *Id.* Agent X apparently enhances the selectivity of Great Lakes' fluorination reaction, as well as the catalyst life, but the process would not work in the absence of chromium. *Id.*, 2005 U.S. Dist. LEXIS 7347, *slip op. at 18, 20.*

n1 Throughout this opinion, we will refer to a component of Great Lakes' proprietary catalyst formulation as Agent X.

On July 1, 2002, Atofina filed a complaint in the United States District Court for the District of Delaware accusing Great Lakes of infringing of the '514 patent. Great Lakes filed an answer and a counterclaim, alleging noninfringement, invalidity, and unenforceability because of inequitable conduct. After a bench trial, the court concluded that (1) Great Lakes did not infringe the '514 patent; (2) claims 1, 2, 6, 7, 9, and 10 were anticipated by JP 51-82206; (3) claim 5 of the '514 patent would not have been obvious in view of the prior art; (4) the '514 patent was not invalid for lack of enablement or failure to disclose the best mode; and (5) the '514 patent was unenforceable because [\*\*5] of inequitable conduct. *Id.*, 2005 U.S. Dist. LEXIS 7347, *slip op. at 68.* The court's holdings as to infringement, invalidity because of anticipation, and unenforceability because of inequitable conduct are at issue in this appeal.

First, the district court relied on the specification, the prosecution history, and dictionaries to construe the term "chromium catalyst" to mean "a substance that alters the velocity of a chemical reaction without itself being consumed, where the only catalytically active material is chromium without the addition of metal oxides, alkali metal fluorides, or non-inert additives." *Id.*, 2005 U.S. Dist. LEXIS 7347, *slip op. at 28-29.* The court then determined that Great Lakes' catalyst did not meet the "bulk or supported chromium catalyst" limitation because it contained a non-chromium substance, Agent X, that was catalytically active or at the very least a non-inert additive that had been disclaimed in the specification. *Id.*, 2005 U.S. Dist. LEXIS 7347, *slip op. at 35-36.* In addition, the court found that Great Lakes' catalyst contained a metal oxide other than chromium oxide that had been disclaimed by the applicants of the '514 patent during prosecution. *Id.*, 2005 U.S. Dist. LEXIS 7347, *slip op. at 36-37.*

Second, the district court held that claims [\*\*6] 1, 2, 6, 7, 9, and 10 were anticipated by JP 51-82206. *Id.*, 2005 U.S. Dist. LEXIS 7347, slip op. at 39-45. Relying on *Titanium Metals Corporation v. Banner*, 778 F.2d 775, 782 (Fed. Cir. 1985), the court determined that the broader temperature range of 100 to 500 [degrees] C recited in JP 51-82206 anticipated the narrower temperature range of 330 to 450 [degrees] C disclosed in the '514 patent. *Opinion*, 778 F.2d 775, slip op. at 41. The court also found that the additional limitation in claim 2, that the oxygen to methylene chloride molar ratio be between 0.5 percent and 3 percent, was anticipated by JP 51-82206's disclosure of part of that range (0.001 to 1 percent oxygen to methylene chloride molar ratio), again relying on *Titanium Metals*. *Id.*, 778 F.2d 775, slip op. at 42. Furthermore, the court determined that although JP 51-82206 does not mention the contact times disclosed in claims 6 and 10, it nevertheless anticipates those claims because the "contact times may be calculated based on the information provided in the examples of JP 51-82206." *Id.*, 778 F.2d 775, slip op. at 43-44. The court also held that JP 51-82206 provides an enabling disclosure of the claimed process. *Id.*, 778 F.2d 775, slip op. at 45-47.

Finally, [\*\*7] the district court held that the '514 patent was unenforceable because of inequitable conduct. *Id.*, 778 F.2d 775, slip op. at 58-67. The court first found that the fully translated version of JP 51-82206, which was not submitted to the PTO, was highly [\*\*995] material "because it anticipated all the limitations of claims 1, 2, 6, 7, 9, and 10 of the '514 patent." *Id.*, 778 F.2d 775, slip op. at 62, 66. The court then determined that Atofina intended to deceive the PTO based on its failure to disclose the full English translation of JP 51-82206, which it had in its possession. *Id.*, 778 F.2d 775, slip op. at 64. The court also based its finding of intent on Atofina's alleged misrepresentations to the PTO that JP 51-82206 disclosed a catalyst containing "chromium oxide and optionally other metal oxides" without mentioning that JP 51-82206 disclosed a catalyst of pure chromium oxide, as well as Atofina's alleged mischaracterizations of JP 51-82206 with respect to the scope of the reference and the contact times used in the reference. *Id.*, 778 F.2d 775, slip op. at 64-65. After balancing materiality and intent, the court concluded that the '514 patent was unenforceable because of inequitable conduct. *Id.*, 778 F.2d 775, slip op. at 67.

The district [\*\*8] court entered judgment in favor of Great Lakes on March 23, 2005. Atofina timely appealed, and we have jurisdiction pursuant to 28 U.S.C. § 1295(a)(1).

## DISCUSSION

[HN1] Claim construction is an issue of law, *Markman*

*v. Westview Instruments, Inc.*, 52 F.3d 967, 970-71 (Fed. Cir. 1995) (en banc), that we review de novo, *Cybor Corp. v. FAS Techs., Inc.*, 138 F.3d 1448, 1456 (Fed. Cir. 1998) (en banc). The district court's determination of infringement, in contrast, is a question of fact that we review for clear error. *Centricut, LLC v. Esab Group, Inc.*, 390 F.3d 1361, 1367 (Fed. Cir. 2004). Anticipation is also a question of fact that we review for clear error. *Hoover Group, Inc. v. Custom Metalcraft, Inc.*, 66 F.3d 299, 302 (Fed. Cir. 1995). Finally, we review a district court's ultimate determination of inequitable conduct for abuse of discretion, and its threshold findings regarding materiality and intent to mislead for clear error. *Brasseler, U.S.A. I, L.P. v. Stryker Sales Corp.*, 267 F.3d 1370, 1379 (Fed. Cir. 2001). "A finding is 'clearly erroneous' when although there is evidence [\*\*9] to support it, the reviewing court on the entire evidence is left with the definite and firm conviction that a mistake has been committed." *United States v. U.S. Gypsum Co.*, 333 U.S. 364, 395, 68 S. Ct. 525, 92 L. Ed. 746 (1948).

## I. Infringement

On appeal, Atofina argues that the district court incorrectly construed the term "chromium catalyst." Atofina asserts that the correct construction of "chromium catalyst" is a substance which causes the reaction to take place in which chromium is the catalytically active metal. Atofina also contends that the court erred in excluding all "metal oxides" and "non-inert additives" from the meaning of "chromium catalyst" based on statements in the specification and in the prosecution history. According to Atofina, the court read those statements out of context and they did not amount to a "clear and unmistakable" surrender of subject matter. In addition, Atofina contends that the court misread the Buckman reference, U.S. Patent 3,644,545, in excluding alkali metal fluorides. Atofina then argues that under its construction of "chromium catalyst," Great Lakes' process infringed the '514 patent because the process would not have worked without [\*\*10] chromium. Atofina further asserts that the patent covers catalysts made from chromium derivatives, and that the catalyst Great Lakes uses is a chromium derivative.

Great Lakes responds that the district court correctly construed "chromium catalyst" to exclude metal oxides, non-inert additives, and alkali metal fluorides. According [\*\*996] to Great Lakes, Atofina disclaimed catalysts containing catalytically active substances other than chromium and catalysts containing non-inert additives. As support for its argument, Great Lakes points to statements in the specification that the catalyst in the '514 patent is "based on pure chromium (without the addition of another metal oxide)" and Atofina's assertions in the prosecution history that it was "unnecessary to employ

special additives" to increase the selectivity of its catalyst, and that the claims excluded "utilization of a combination catalyst, such as that taught by Tsuji," which disclosed a chromium-indium catalyst. Great Lakes then argues that it did not infringe the '514 patent because its catalyst contains Agent X, a catalytically active material other than chromium or alternatively a non-inert additive.

We agree with Great Lakes that [\*11] the court did not err in finding a lack of infringement. [HN2] Our primary focus in determining the ordinary and customary meaning of a claim limitation is to consider the intrinsic evidence of record, viz., the patent itself, including the claims, the specification and, if in evidence, the prosecution history, from the perspective of one of ordinary skill in the art. *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312-17 (Fed. Cir. 2005) (en banc). At the same time, Phillips confirmed that courts may "rely on dictionary definitions when construing claim terms" and that "dictionaries . . . are often useful to assist in understanding the commonly understood meaning of words." *Id.* at 1322 (quoting *Vitronics Corp. v. Conceptronic, Inc.*, 90 F.3d 1576, 1584 n6 (Fed. Cir. 1996)). We have also stated, however, that "the court must ensure that any reliance on dictionaries accords with the intrinsic evidence: the claims themselves, the specification, and the prosecution history. . . . In those circumstances where reference to dictionaries is appropriate, the [court's] task is to scrutinize the intrinsic evidence in order to determine the most [\*12] appropriate" definition. *Free Motion Fitness, Inc. v. Cybex Int'l, Inc.*, 423 F.3d 1343, 1348-49 (Fed. Cir. 2005) (citing *Phillips*, 415 F.3d at 1314, 1322-24).

As an initial matter, we conclude that the district court properly relied on scientific and technical dictionaries to construe the ordinary and customary meaning of the term "catalyst" as "a substance that alters the velocity of a chemical reaction without being consumed." Because there is no suggestion that the intrinsic evidence defines the term "catalyst," one may look to technical dictionaries for assistance in determining that term's meaning to a person of ordinary skill in the art. *Phillips*, 415 at 1318 [HN3] ("Because dictionaries, and especially technical dictionaries, endeavor to collect the accepted meanings of terms used in various fields of science and technology, those resources have been properly recognized as among the many tools that can assist the court in determining the meaning of particular terminology to those of skill in the art of the invention. Such evidence, we have held, may be considered if the court deems it helpful in determining 'the true meaning of language used [\*13] in the patent claims.'"). The McGraw-Hill Dictionary of Scientific and Technical Terms 307 (4th ed. 1989) defines a catalyst as a "substance that alters the velocity of a chemical reaction and may be recovered essentially unaltered in form

and amount at the end of the reaction." The district court correctly accepted that ordinary and customary meaning.

Having agreed with the court's definition of the term "catalyst," we also agree with its construction of "chromium catalyst" as a catalyst where the only catalytically active material is chromium without [\*997] the addition of metal oxides or non-inert additives. The intrinsic record supports that interpretation. The specification states that "it has now been found that there is a temperature range in which a catalyst based on pure chromium (without the addition of another metal oxide) can produce, in the presence of oxygen," difluoromethane. '514 patent, col. 2, II. 54-59 (emphasis added). The specification further explains that "it is necessary to have a catalyst containing solely chromium." *Id.*, col. 7, II. 7-12. In addition, the specification makes clear that it is "unnecessary to employ special additives to increase [the fluorination [\*14] reaction's] selectivity; the elimination of additives employed in the mixed catalysts enables the manufacture of the catalyst to be simplified and thereby its cost to be reduced." *Id.*, col. 3, II. 10-14. We note that the use of the term "chromium" in the patent includes chromium oxide as it refers to "solely chromium (catalysts A and B)," and catalyst A is chromium oxide. *Id.*, col. 7, II. 8-9.

The prosecution history confirms a construction of "chromium catalyst" that excludes metal oxides and non-inert additives. As discussed in Phillips, the meaning of the claim language may be limited by a disclaimer in the specification or prosecution history. 415 F.3d at 1316-17. Here, the applicants' statements in distinguishing their claimed "bulk or chromium catalyst" over prior art are a disclaimer of claim scope as to metal oxides and non-inert additives. The '514 claims were initially rejected on August 6, 1997, as obvious over the prior art. The applicants responded on December 30, 1997, that "the claims recited the phrase 'consisting essentially of' which would exclude the utilization of a combination catalyst, such as that taught by [the Tsuji reference, EP [\*15] 629440]. Nowhere in the applicants' disclosure is there mentioned a combination of chromium and indium catalyst. Rather the applicants' disclosure in comparative examples 2 and 3 indicates the criticality of utilizing chromium catalyst alone rather than in combination with other metal components." (emphasis added).

The applicants also pointed out that contrary to what might be expected from the prior art, its chromium-based catalyst carried out the fluorination reaction without a decrease in the selectivity of the reaction and that it was "therefore unnecessary to employ special additives to increase its selectivity." The applicants repeated these assertions in their August 20, 1998, response to the PTO's second rejection. In addition, the applicants stated that

"pure chromium means without the addition of a metal oxide" and that "contrary to what might be expected from the prior art, the present invention makes it possible to employ a catalyst based solely on chromium to carry out this fluorination reaction." We thus agree with the district court that the applicants' statements are a disclaimer of claim scope as to catalysts containing metal oxides and non-inert additives. [\*16] *Phillips*, 415 at 1317 [HN4] ("The prosecution history can often inform the meaning of the claim language by demonstrating how the inventor understood the invention and whether the inventor limited the invention in the course of prosecution, making the claim scope narrower than it would otherwise be.").

The district court also interpreted "chromium catalyst" as excluding catalysts containing alkali metal fluorides. The basis for the district court's construction as to "alkali metal fluorides" is the applicants' statements in the prosecution history that "the recent claims exclude the utilization of an alkali metal fluoride noted in column 1, line 59 of Buckman, [U. S. Patent 3,644,545]." Buckman, which is entitled "Improved [\*998] Vapor Phase Fluorination Procedure in the Presence of Catalyst and Alkali Metal Fluoride," discloses a fluorination reaction "in the presence of a catalyst, when such reaction is carried out in the presence of an alkali metal fluoride." '545 patent, col. 1, ll. 54-59. While the Buckman specification apparently differentiates between the catalyst and the alkali metal fluoride in naming illustrative substances that may be employed as catalysts (Cr<sub>2</sub>O<sub>3</sub>, CrF<sub>3</sub>, and AlF<sub>3</sub>) [\*17] versus alkali metal fluorides (KF and NaF) that should also be present in the reaction, but perhaps not as catalysts, and the applicants may thus have not intended to exclude an alkali metal fluoride as a catalyst, we are not prepared to find error in the district court's exclusion of alkali metal fluorides from its claim construction, as an alkali metal fluoride is clearly in the reference that the applicants were distinguishing. *Id.*, col. 2, ll. 47, 55.

We reject Atofina's argument that the district court erred in its construction of "chromium catalyst" because the applicants' statements regarding "metal oxides" were intended to distinguish only nickel-chromium catalysts, not Agent X-chromium catalysts. That the applicants only needed to surrender nickel-chromium catalysts to avoid a prior art reference does not mean that its disclaimer was limited to that subject matter. "To the contrary, [HN5] it frequently happens that patentees surrender more through amendment than may have been absolutely necessary to avoid particular prior art. In such cases, we have held the patentees to the scope of what they ultimately claim, and we have not allowed them to assert that claims should be interpreted [\*18] as if they had surrendered only what they had to." *Norian Corp. v. Stryker Corp.*, 432 F.3d 1356, 1361-62 (Fed. Cir. 2005) (citing *Fantasy Sports*

*Props., Inc. v. Sportsline.com, Inc.*, 287 F.3d 1108, 1114-15 (Fed. Cir. 2002)). Here, the patentee spoke expressly to the meaning of "chromium catalyst," both in the specification and in the prosecution history, noting that the catalyst was limited to "pure chromium (without the addition of another metal oxide)." We therefore agree with the district court that Atofina surrendered all catalysts containing non-chromium metal oxides.

Having affirmed the district court's claim construction of the term "chromium catalyst," we also affirm its judgment of noninfringement. First, the court found that "both the Johnson Matthey report and the Syntex report demonstrated that defendant's catalysts contained several metal oxides including Agent X oxide." *Opinion*, 2005 U.S. Dist. LEXIS 7347, slip op. at 36-37. While we have some question from reading the record whether Great Lakes' catalyst actually contains an Agent X oxide, we nonetheless will defer to the district court's finding of fact on that issue. It is not clearly erroneous. Second, [\*19] we discern no clear error in the court's alternative determination that Agent X, if not a catalyst, was a non-inert additive. *Id.*, 2005 U.S. Dist. LEXIS 7347, slip op. at 35 n. 13. Thus, because the district court made no clear error in its finding that Great Lakes did not infringe Atofina's properly construed claims, we affirm its judgment of non-infringement.

## II. Anticipation

On appeal, Atofina argues that JP 51-82206 does not anticipate any claim of the '514 patent because it does not disclose the manufacture of difluoromethane, recited in the preamble of claim 1; its disclosure of a broader temperature range does not anticipate the specific temperature range claimed in the '514 patent; its disclosure of an oxygen to methylene molar ratio of 0.001 to 1.0 is not a disclosure of the claimed range of 0.1 to 5.0 percent; [\*999] and it does not disclose the contact times required in claims 6 and 10. According to Atofina, the court's reliance on Titanium Metals was misplaced because that case stands for the proposition that a species can anticipate a genus, not the reverse.

Great Lakes responds that JP 51-82206 anticipates claims 1, 2, 6, 7, 9, and 10 of the '514 patent because the claimed ranges are within [\*20] the disclosure of ranges in the prior art. According to Great Lakes, JP 51-82206's disclosure of a preferred temperature range of 150 to 350C encompasses the temperature range disclosed in the '514 patent of 330 to 450C. Great Lakes also contends that JP 51-82206's disclosure of the oxygen to methylene chloride molar ratios of 0.001 percent to 1.0 percent encompasses the ratios claimed in the '514 patent of 0.1 percent to 5.0 percent. In addition, Great Lakes argues that even though JP 51-82206 does not disclose

the contact times as required by claims 6 and 10 of the '514 patent, the contact times are "typically and easily determined through calculation, by a person of ordinary skill in the art."

We agree with Atofina that the district court clearly erred in finding that JP 51-82206 anticipates the '514 patent. [HN6] Anticipation requires a showing that each limitation of a claim is found in a single reference, either expressly or inherently. *Perricone v. Medicis Pharm. Corp.*, 432 F.3d 1368, 1376 (Fed. Cir. 2005). However, each limitation of the '514 claims is not in JP 51-82206. [HN7] It is well established that the disclosure of a genus in the prior art is not necessarily a [\*21] disclosure of every species that is a member of that genus. See, e.g., *In re Baird*, 16 F.3d 380, 382 (Fed. Cir. 1994). There may be many species encompassed within a genus that are not disclosed by a mere disclosure of the genus. On the other hand, a very small genus can be a disclosure of each species within the genus. *In re Petering*, 49 C.C.P.A. 993, 301 F.2d 676, 682, 1962 Dec. Comm'r Pat. 232 (C. C.P.A. 1962); see also *Bristol-Myers Squibb Co. v. Ben Venue Labs., Inc.*, 246 F.3d 1368, 1380 (Fed. Cir. 2001) ("The disclosure of a small genus may anticipate the species of that genus even if the species are not themselves recited."). That is not the case here, however. A temperature range of over 100 degrees is not a small genus and the range of temperatures of JP 51-82206 does not disclose Atofina's temperature range.

To find anticipation here, the district court relied on our opinion in *Titanium Metals*. The court stated that "the '514 patent's claim limitation of 330 to 450C is entirely within JP 51-82206's temperature range of 100 and 500C. Consequently, this limitation of claim 1 is also disclosed by JP 51-82206." *Opinion*, 2005 U.S. Dist. LEXIS 7347, slip op. at 41. However, [\*22] *Titanium Metals* stands for the proposition that [HN8] an earlier species reference anticipates a later genus claim, not that an earlier genus anticipates a narrower species. 778 F.2d at 782. Here, the prior art, JP 51-82250, discloses a temperature range of 100 to 500C which is broader than and fully encompasses the specific temperature range claimed in the '514 patent of 330 to 450C. Given the considerable difference between the claimed range and the range in the prior art, no reasonable fact finder could conclude that the prior art describes the claimed range with sufficient specificity to anticipate this limitation of the claim. Because the court's determination that JP 51-82250 disclosed the temperature range in claims 1, 2, 6, 7, 9, and 10 of the '514 patent was grounded in its erroneous application of *Titanium Metals*, we must reverse its finding of anticipation based on the temperature range.

Further, we reject Great Lakes' argument that the dis-

trict court's finding of anticipation was correct because JP 51-82206 [\*1000] discloses a preferred embodiment using a specific temperature range (a species) that anticipates the '514 patent's claim of a broader temperature range [\*23] (a genus). JP 51-82206 discloses a preferred temperature range of 150 to 350C that slightly overlaps the temperature range claimed in the '514 patent. But that slightly overlapping range is not disclosed as such, i.e., as a species of the claimed generic range of 330 to 450C. Moreover, the disclosure of a range of 150 to 350C does not constitute a specific disclosure of the endpoints of that range, i.e., 150C and 350C, as Great Lakes asserts. The disclosure is only that of a range, not a specific temperature in that range, and the disclosure of a range is no more a disclosure of the end points of the range than it is of each of the intermediate points. Thus, JP 51-82206 does not disclose a specific embodiment of the claimed temperature range.

The district court also clearly erred in finding that the claimed oxygen to methylene chloride molar ratio of 0.1 to 5.0 percent was disclosed in JP 51-82206. JP 51-82206 discloses an oxygen to methylene chloride ratio of 0.001 to 1.0 percent that overlaps but does not fall within the range of ratios claimed in the '514 patent. Moreover, the disclosure of a 0.001 to 1.0 percent range in JP 51-82206 does not constitute a specific disclosure [\*24] of 0.1 percent to 5.0 percent, as Great Lakes asserts. Once again, although there is a slight overlap, no reasonable fact finder could determine that this overlap describes the entire claimed range with sufficient specificity to anticipate this limitation of the claim. The ranges are different, not the same. Indeed, the lower end of the ratio in the reference differs by a factor of one hundred from what is claimed. In addition, the disclosure of a 0.001 to 1.0 percent range is not a disclosure of the end points of that range. Thus, there is no anticipation. Because JP 51-82206 does not expressly or inherently disclose the claimed range of ratios, JP 51-82206 does not anticipate claims 1, 2, 6, 7, 9, and 10 of the '514 patent.

Finally, the district court clearly erred in finding that JP 81-82206 inherently discloses the contact times found in claims 6 and 10 of the '514 patent. Claims 6 and 10 require that the "gas phase mixture of methylene chloride, anhydrous hydrogen fluoride and oxygen is in contact with the catalyst for a time between 0.01 and 10 seconds." '514 patent, col. 8, ll. 6-11. Those contact times are not expressly found in JP 51-82206. Nor has Great Lakes shown that [\*25] the contact times are inherently disclosed in JP 51-82206. The calculations Great Lakes points to as inherently disclosing the contact times are based on the first and second examples in JP 51-82206, which state the diameters and lengths of the reaction tubes and the flow rates, but do not say anything about any contact times.

Because [HN9] anticipation by inherent disclosure is appropriate only when the reference discloses prior art that must necessarily include the unstated limitation, JP 51-82206 cannot inherently anticipate the claims of the '514 patent. *Transclean Corp. v. Bridgewood Servs., Inc.*, 290 F.3d 1364, 1373 (Fed. Cir. 2002). We therefore conclude that the district court clearly erred in determining that the contact times in claims 6 and 10 are disclosed in JP 51-82206.

Because the district court clearly erred in finding that JP 51-82206 discloses the temperature range, the range of oxygen to methylene chloride molar ratios, and the contact times claimed in the '514 patent, we reverse the district court's finding of anticipation.

### III. Inequitable Conduct

On appeal, Atofina argues that the district court abused its discretion in its holding [\*1001] of inequitable conduct because the full English translation of JP 51-82206 that was not submitted to the PTO was not highly material and there was no basis for inferring an intent to deceive the PTO. According to Atofina, the court's sole basis for finding that the English translation of JP 51-82206 was highly material was that the reference anticipated several claims of the '514 patent (its materiality for obviousness purposes was not decided). Thus, Atofina contends that because the court's determination as to anticipation was clearly erroneous, the finding of materiality is also erroneous. As to intent, Atofina also contends that the court failed to consider evidence of good faith, such as Atofina's reference in the prosecution history to page numbers of the full translation of JP 51-82206. Atofina notes that the Derwent Abstract of JP 51-82206 was disclosed to the examiner and JP 51-82206 was cited in the patent specification.

Great Lakes responds that the district court's findings of a high level of materiality and intent were supported by clear and convincing evidence, and thus the court correctly held that the '514 patent was unenforceable. Great Lakes argues that the full English translation [\*27] of JP 51-82206 was highly material because it was anticipatory and it teaches the use of a pure chromium catalyst. Great Lakes also points out that Atofina's application for a European counterpart to the '514 patent was rejected for lack of novelty over JP 51-82206, and issued only after Atofina amended its claims to include an additional limitation. According to Great Lakes, the prosecution of the European counterpart to the '514 patent is evidence of the materiality of the full English translation of JP 51-82206. In addition, Great Lakes argues that Atofina acted with intent to deceive the PTO in failing to disclose the full English translation of JP 51-82206, mischaracterizing prior art references, and also withholding information

regarding poor results during the pilot phase testing of the '514 patent process. Great Lakes also contends that there was no evidence of good faith by Atofina in its failure to disclose the full English translation of JP 51-82206.

We agree with Atofina that the district court abused its discretion in its conclusion that inequitable conduct occurred. [HN10] "A patent may be rendered unenforceable for inequitable conduct if an applicant, with intent to mislead [\*28] or deceive the examiner, fails to disclose material information or submits materially false information to the PTO during prosecution." *Digital Control, Inc. v. Charles Mach. Works*, 437 F.3d 1309, 1313 (Fed. Cir. 2006). "The party asserting inequitable conduct must prove a threshold level of materiality and intent by clear and convincing evidence." *Id.* Further, "materiality does not presume intent, which is a separate and essential component of inequitable conduct." *GFI, Inc. v. Franklin Corp.*, 265 F.3d 1268, 1274 (Fed. Cir. 2001) (quoting *Manville Sales Corp. v. Paramount Sys., Inc.*, 917 F.2d 544, 552 (Fed. Cir. 1990)).

The issue here is whether Great Lakes proved intent by clear and convincing evidence. The district court inferred intent from the applicants' failure to disclose the full English translation of JP 51-82206 and its alleged mischaracterizations of that reference. However, the applicants' failure to disclose the full English translation of JP 51-82205 is not in and of itself enough to infer intent, even if the full English translation went beyond the Derwent Abstract, which is far from clear. See *Semiconductor Energy Lab. Co. v. Samsung Elecs. Co.*, 204 F.3d 1368, 1378 (Fed. Cir. 2000) [\*29] [HN11] ("The duty at issue in this case is the duty of candor, not the duty of translation."). "Intent to deceive can not [\*1002] be inferred solely from the fact that information was not disclosed; there must be a factual basis for a finding of deceptive intent." *Hebert v. Lisle Corp.*, 99 F.3d 1109, 1116 (Fed. Cir. 1996).

The district court's finding of intent additionally rests on three statements made by the applicants to the PTO: (1) the applicants' statement that JP 51-82206 discloses a catalyst containing "chiefly chromium oxide and optionally other metal oxides"; (2) the applicants' statement that a "person skilled in the art, who is looking for a means of fluorinating a specific H containing halocarbon (CH<sub>2</sub>Cl<sub>2</sub>) with good [\*1003] selectivity is therefore not prompted to consider the teachings of . . . JP 51-82206"; and (3) the applicants' statement that "these specific process conditions effect a contact time of 10 seconds or less .... The short contact time is not taught in the applied references. Contact time indicated in the references are substantially in excess of this." *Opinion*, 2005 U.S. Dist. LEXIS 7347, slip op. at 64-65 (emphasis in original). The court deter-



mined that the first statement [\*\*30] misrepresented to the PTO that JP 51-82206 failed to disclose a catalyst of pure chromium oxide, the second statement mischaracterized JP 51-82206 by failing to identify that methylene chloride was a preferred starting material in that reference, and the third statement mischaracterized JP 51-82206 by failing to mention the inherent "contact times" allegedly disclosed in JP 51-82206.

We conclude that the district court clearly erred in finding that these three statements were sufficient to prove intent. First, the applicants' statement that JP 51-82206 discloses a catalyst containing "chiefly chromium oxide and optionally other metal oxides" is consistent with the text of the full English translation of JP 51-82206, which asserts that its catalyst is "mainly comprising chromic oxide." And the Derwent Abstract that was disclosed to the PTO also states that the catalyst is "mainly comprising trivalent chromium oxide." "Mainly" and "chiefly" are words with similar meanings. Thus, there was no real difference between the disclosed Derwent Abstract and the undisclosed full English translation of JP 51-82206 in this context.

While the dissent states that "some parts of the majority opinion [\*\*31] appear to hold there was no misdescription because JP 51-82206 does not disclose pure chromium oxide," that is incorrect. JP 51-82206 does disclose the use of a catalyst containing pure chromium oxide, JP 51-82206 at 4 ("Not only pure Cr<sub>2</sub>O<sub>3</sub> but also chromium oxides mainly comprising Cr<sub>2</sub>O<sub>3</sub> are usable in the present invention."), and we do not state otherwise. Moreover, characterizing a catalyst, as Atofina did, as containing "chiefly chromium oxide and optionally other metal oxides" is not inconsistent with it possibly being pure chromium oxide. Further, the dissent states that "chiefly chromium oxide" does not mean "chiefly Cr<sub>2</sub>O<sub>3</sub>" because "JP 51-82206 clearly used the term 'chromium oxides' to include oxides other than Cr While the language "chiefly chromium 2O3." oxide" does encompass chromium oxides other than Cr<sub>2</sub>O<sub>3</sub>, it expressly discloses Cr<sub>2</sub>O<sub>3</sub>. Therefore, no reasonable fact finder could conclude that the applicants misrepresented to the PTO that JP 51-82206 failed to disclose a catalyst of pure chromium oxide. Because the applicants' statement was consistent with both the full English translation of JP 51-82205 and the Derwent Abstract, the district court clearly erred in finding [\*\*32] that it supported an inference of intent.

Second, the applicants' statement that a "person skilled in the art, who is looking for a means of fluorinating a specific H containing halocarbon (CH<sub>2</sub>Cl<sub>2</sub>) with good selectivity is therefore not prompted to consider the teachings of . . . JP 51-82206" was not an omission of the fact that the preferred starting material in JP 51-82206

was methylene chloride. The seven starting materials disclosed in JP 51-82206, including methylene chloride, are disclosed in the first column of the '514 patent. '514 patent, col. 1, ll. 58-59. The applicants also stated to the examiner that JP 51-82206 "mentions, among the reactions, the fluorination of CCl<sub>4</sub>, CHCl<sub>3</sub>, CH<sub>2</sub>Cl<sub>2</sub> [methylene chloride], CCl<sub>3</sub>F, C<sub>2</sub>Cl<sub>6</sub>, C<sub>2</sub>Cl<sub>4</sub>, and C<sub>2</sub>H<sub>3</sub>Cl<sub>3</sub>" and that the "preferred starting materials contemplated [in JP 51-82206] . . . include perhalogenated molecules as well as H containing molecules," which include methylene chloride. Based on the record, we conclude that the district court clearly erred in finding that the applicants' statement was an attempt to hide the fact that methylene chloride was a preferred starting material in JP 51-82206.

Third, the applicants' statement [\*\*33] that "these specific process conditions effect a contact time of 10 seconds or less . . . The short contact time is not taught in the applied references. Contact time indicated in the references are substantially in excess of this" does not support an inference of an intent to deceive. As discussed previously, JP 51-82206 does not disclose any "contact times." Therefore, the district court clearly erred in finding that applicants' statement was misleading.

Thus, because the district court clearly erred in its findings of fact relating to an intent to deceive the PTO, we conclude that its holding of inequitable conduct based on those findings was an abuse of discretion. We therefore reverse that holding. Inasmuch as we reverse on intent, we do not discuss materiality.

— We have considered the parties' remaining arguments and find them unpersuasive.

#### CONCLUSION

We affirm the district court's conclusion of no literal infringement. The district court, however, clearly erred in finding that JP 51-82206 was an anticipatory reference meeting all the limitations of claims 1, 2, 6, 7, 9, and 10 of the '514 patent and also clearly erred in finding that Atofina intended to deceive the PTO so [\*\*34] as to support a determination of inequitable conduct. We therefore affirm the court's judgment of no literal infringement, and we reverse its holdings of invalidity because of anticipation and unenforceability for inequitable conduct.

#### AFFIRMED IN PART AND REVERSED IN PART

CONCURBY: DYK (In Part)

DISSENTBY: DYK (In Part)

DISSENT: DYK, Circuit Judge, concurring in part and dissenting in part.

I join the court's opinion insofar as it affirms the district court's finding of no literal infringement and reverses as to invalidity. I also agree that the district court's inequitable conduct determination cannot stand. In my view, that determination rests on an erroneous finding of materiality based on a finding that JP 51-82206 anticipated claims 1, 2, 6, 7, 9, and 10 of the '514 patent. I would vacate and remand this issue so that the district court can reconsider the inequitable conduct claim free of this error. In my view the majority errs in deciding to reverse without remand.

The majority does not address the issue of materiality, but reverses the district court's inequitable conduct determination on the ground that the district court's intent finding was clearly erroneous. I do not disagree [\*35] with the majority's [\*1004] determination that the district court's second and third grounds for finding intent were clearly erroneous. However, a key question on the issue of intent was whether the applicants misdescribed JP 51-82206 by stating that JP 51-82206 disclosed a catalyst "containing chiefly chromium oxide and optionally other metal oxides" as opposed to describing JP 51-82206 as disclosing a pure chromium oxide catalyst. (If it disclosed pure chromium oxide it would be highly material to the prosecution of this patent, even though not anticipatory.) Some parts of the majority opinion appear to hold that there was no misdescription because JP 51-82206 does not disclose pure chromium oxide and the applicants accurately stated that it contained "chiefly chromium oxide and optionally other metal oxides."

The district court stated that "JP 51-82206 specifies that the chromium catalyst can either be 'pure' chromium oxide or mainly chromium oxide." *Atofina v. Great Lakes Chem. Corp.*, 2005 U.S. Dist. LEXIS 7365, Civ. No. 02-1250, slip op. at 4 (D. Del. Feb. 23, 2005); see also *id.* 2005 U.S. Dist. LEXIS 7365, at 42. The finding that JP 51-82206 discloses pure chromium oxide is supported by the text of JP 51-82206 which states:

The [\*36] Cr<sub>2</sub>O<sub>3</sub> catalyst usable in the present invention can be prepared by various processes . . . [Describing calcinations processes]. Cr<sub>2</sub>O<sub>3</sub> prepared by calcining a chromium compound containing chromium hydroxide is particularly preferred. Cr<sub>2</sub>O<sub>3</sub> prepared by these processes is not pure but it contains a small amount of other chromium oxides and has an atomic ratio of O/Cr of about 1.4 to 1.7. Not only pure Cr<sub>2</sub>O<sub>3</sub> but also chromium oxides mainly comprising Cr<sub>2</sub>O[3] are usable in the present invention. A metal oxide other than chromium oxide

such as an alkaline earth metal oxide can be added to the catalyst as another constituent.

J.A. 3037 (emphasis added). While JP 51-82206 may not disclose the use of pure Cr<sub>2</sub>O<sub>3</sub>, it certainly discloses the use of pure "chromium oxides" without the presence of other metals, as is required by the '514 patent. n1

n1 Atofina appears to argue that "chiefly chromium oxide"—which is how it described the catalyst disclosed in JP 51-82206—means "chiefly Cr [2]O[3]." This is misleading. Chromium oxide is "[a] compound of chromium and oxygen; chromium may be in the +2, +3, or +6 oxidation state." McGraw-Hill Dictionary of Scientific and Technical Terms 390 (6th ed. 2003); see also Van Nostrand's Scientific Encyclopedia 787 (9th ed. 2002) (describing "the three oxides of chromium" as "CrO, Cr[2]O[3], and CrO[3]"). Further, JP 51-82206 clearly used the term "chromium oxides" to include oxides other than Cr[2]O[3].

[\*\*37]

What a prior art reference discloses or teaches is a question of fact. *Novo Nordisk Pharm., Inc. v. Bio-Tech. Gen. Corp.*, 424 F.3d 1347, 1355 (Fed. Cir. 2005); *Winner Int'l Royalty Corp. v. Wang*, 202 F.3d 1340, 1349 (Fed. Cir. 2000). On this record, I see no basis for disturbing the district court's factual finding that JP 51-82206 disclosed "pure" chromium oxide.

The majority ultimately agrees that JP 51-82206 does disclose pure chromium oxide, but nonetheless concludes that the description in JP 51-82206 is not misleading. I cannot agree. The district court found as a factual matter that Atofina, which was in possession of a full-length English translation of JP 51-82206, misrepresented this aspect of the Japanese patent to the PTO. In the '514 patent, and in representations to the PTO, Atofina described JP 51-82206 as claiming a catalyst "containing chiefly chromium oxide and optionally other metal oxides." J.A. 1129 at 1:48-49 (emphasis added). The district court determined that Atofina's use of the term "chiefly" was misleading in that it implied that the Japanese patent only disclosed [\*1005] a chromium catalyst which included other components, [\*38] rather than disclosing a catalyst containing chromium oxides. *Atofina*, 2005 U.S. Dist. LEXIS 7365, Civ. No. 02-1250, slip op. at 64. The majority rejects the district court's interpretation, stating that "characterizing a catalyst, as Atofina did, as containing 'chiefly chromium oxide and optionally other metal oxides' is not inconsistent with it possibly being pure chromium oxide." Maj. Op. at 20 (emphasis added). The

441 F.3d 991, \*1005; 2006 U.S. App. LEXIS 7180, \*\*38;  
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majority thus appears to hold that the description is not misleading because it is not a direct misstatement. I fail to see how the majority can rule as a matter of law that the district court could not find that Atofina's reference is misleading because of the implication that it conveys. See *Semiconductor Energy Lab v. Samsung Elecs. Co.*, 204 F.3d 1368, 1377 (Fed. Cir. 2000) (affirming a finding of inequitable conduct where the patentee submitted a one-page, partial translation of a foreign reference because the partial translation focused "on less material portions" and

"left the examiner with the impression that the examiner did not need to conduct any further translation or investigation"). In context, the withholding of information that JP 51-82206 did in fact [\*\*39] disclose pure chromium oxide could itself support a finding of intent.

Under these circumstances, it is possible that the district court could properly find intent in connection with this withholding of JP 51-82206. I would afford the district court the opportunity to reconsider its inequitable conduct determination.